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AUTHOR Holholt, Pat A.
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ABSTRACT

Findings of the study described in this report indicate that the attitudes of library school students toward library automation were not changed significantly by a semester of relevant coursework. It has been hypothesized that these students would have a somewhat negative attitude toward automation, but that through relevant course instruction their attitude would become more positive. The control group--a class in children's literature--and the experimental group--a class in library automation--were given a pre-test at the beginning and a post-test at the end of the semester. It was expected that exposure to library automation in the experimental group would significantly alter post-test response. The Semantic Differential (SD) test of Ford and Young, with some modification, was used to assess attitude. Attitudes of the students as measured by the 15-concept, 20-item, bipolar scale semantic differential test were shown to be only slightly positive. No significant change, positive or negative, was shown by a re-test after the duration of a semester. Included are statistical data tables, t-test scores, a sample questionnaire, and mean scores by concept. (CWM)

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LIBRARY AUTOMATION: A MEASURE OF ATTITUDE

Pat Molholt

Submitted in partial fulfillment
of the requirements for the degree

Specialist in Librarianship

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For some reason spouses, although not altogether omitted, are always mentioned last and frequently preceeded by the phrase, "and last but not least...." I feel very indebted to the assistance rendered me by my husband Garrett Molholt, Ph.D. His advice and editing have helped smooth many rough spots. He deserves mention first.

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I. INTRODUCTION AND BACKGROUND

Questions, if not outright fears, have been raised for years regarding the role of automation and computers in our society. Some have felt there is considerable good to be gained, [1,2,3] while others call our attention to the dehumanizing aspects of being reduced to an eight digit number on a punch card. [4,5] Ferry expresses the attitude that technology, including that of the computer, is "subtracting as much or more from the sum of human welfare as it is adding."[6] In dealing with computers, Dorf says, we are dealing with something too complicated for us to understand.[7] The human monopoly on storing and using information has been

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[1] K.B. London, The People Side of Systems; The Human Aspects of Computer Systems (London, New York: McGraw-Hill, 1976)

[2] H.C. Atkinson, "Personal Savings Through Computerized Library Systems," Library Trends vol. 34 No. 4, p. 587-94.

[3] H.A. Simon, "What Computers Mean for Man and Society," Science Vol. 195, 1977, p. 1186-1191.

[4] C.P. Auger, "Automation in Libraries; Its Possibilities and Probable Effects," Library Association Records Vol. 59 No. 11, Nov. 1957, p. 359-361.

[5] E. Steinhagen, "Implication of Automation for Librarians," Unpublished paper, May 1977. (Typescript)

[6] H. Ferry, "Must We Rewrite the Constitution to Control Technology?," Saturday Review Vol. 51 Mar. 2, 1968, p. 50-54.

[7] R.C. Dorf, Technology, Society and Man (San Francisco: Boyd and Fraser Publishing Co., 1974), p. 93.

broken, Hamilton warns, and fear, mistrust and dislike follow.[8]

Steinhagen studied the problem of computer implications in library work, dividing her report into the decades 1955-1956 and 1965-1975. She noted that concerns moved from the nature of the machine and how to make use of it,to concerns for individuals interacting with or being replaced by computers.[9] Exceptions to this negativism are reported in tests preformed to help determine individuals' attitudes toward automation. The results are interesting and generally positive. Law introduced his study with the quote "The unknown world of the computer sciences tends to threaten [educators'] security.,"[10] yet his study showed educators at all levels reacted rather neutrally toward educational data processing. His conclusion was that change and improvement using computers has been discussed, but that little action has been taken in most schools to make either the threats or promises a reality.

Hoppe and Berv predicted a very positive attitude on the part of designers of automation products and a very negative attitude from workers unemployed because of automation.[11] Those predictions

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[8] D. Hamilton, Technology, Man and the Environment (New York: Charles Scribner's Sons, 1973).

[9] E. Steinhagen, op. cit.

[10] A.I. Law, "A semantic Differential Study of Meaning Held by Public School Personnel Toward Data Processing," California Journal of Educational Research Vol. 19 No. 4, 1968, p. 157.

[11] R.A. Hoppe and E.J. Berv, "Measurement of Attitudes Toward Automation," Personnel Psychology Vol. 20 No. 1 1967, p. 65-70.

were supported by the study. A third test group consisting of insurance company managers whose firms are highly computer dependent showed a neutral attitude. No explanation for the results was offered.

In the summer of 1971 a national survey was conducted with 1501 adults. This survey was a joint project of The American Federation of Information Processing Societies, Inc. and TIME Magazine. It was found that over 50% of the respondents felt that there is a high degree of involvement with computers in their jobs. Thirty-four percent reported they have had a problem because of a computer, although, about 75% of them said they never had problems in having a computerized bill corrected. Of those who have had such a problem, the vast majority felt it was more the fault of company personnel rather than the fault of the computer. Approximately 91% agreed that computers are affecting our lives. Seventy-five percent said it was for the better.[12]

For the Seventh Annual Colloquium on Information Retrieval, 1970, Ford and Young conducted a rather hurried survey of college students to "measure a limited number of attitudes about modern

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[12]American Federation of Information Processing Societies, Inc. and TIME Magazine, Inc., "A National Survey of the Public's Attitudes Toward Computers," Conducted by Lieberman Research, Inc. of New York n.p. n.d.

technology,"[13] specifically computer technology. They felt there existed a "free-floating anxiousness"[14] about computer technology which public education, via popular culture, should be directed to dissipate. To test this feeling, they used the Semantic Differential technique. Their findings were inconclusive. There were inconsistencies. Computers being judged as timely, wise and good, but also cruel and ugly. Their conclusion was:

> This inconsistency is significant. How can computers and technology be unfavorable in one case and favorable in another? The trends of these attitudes seem to substantiate the contention that the images of modern technology, which are presented by mass culture, are presented ambiguously. Because of this ambiguity, the images do not allow the receiver to form a definite and rational opinion or attitude. More exhaustive data, however, from people of various occupations and all age levels is needed to verify this conclusion.[15]

Their study formed, in part, the impetus for this paper.

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[13] J.R. Ford and W.R. Young, "Information Retrieval: Who Needs It?," in National Symposium on Information Retrieval 7th, Philadelphia 1970 (Philadelphia, College of Physicians of Philadelphia, National Documentation Service, 1970) p. 369.

[14] Ibid.

[15] Ibid., p. 372

II. THE RESEARCH PROBLEM AND DESIGN

Ford and Young conducted a survey in 1970 to ascertain the attitudes of college students towards automation. The questions that arose in regard to librarians was "Are library school students' attitudes significantly different than those of a general population of college students?" If so, then some of the reluctance to library use of computers that has been exhibited might be explained simply by this "negative" attitude. Furthermore, it was believed that increased familiarity with the advantages and the limits of the computer would produce a change in attitude. Specifically, it was felt that library school students, in general, would hold somewhat negative attitudes towards computers but that students who had at least a minimal acquaintance, through course instruction, would be more "positively" disposed towards automation.

Within the limits of time and resources available it was determined that this study would be conducted with students enrolled in a library automation course in the library school at the University of Wisconsin - Madison. Although the course objectives are not designed to change attitudes, it was assumed that exposure to the computer's capabilities would create some change in attitude. The initial design called for a single pre-test and post-test comparison of grouped scores on a standard attitude measuring instrument. In order to determine if changes could be attributed to a single maturation process it was decided to compare scores with students enrolled in a course that could be assumed to be

empirically resolved concerning comparisons and extensions.

For this study the groups chosen were students enrolled in a Children's Literature class and students enrolled in a library science class. The latter were considered to be the experimental group (receiving instruction about the computer) and the former represented the control group. It was expected that scores on an attitude measuring instrument for both classes would be identical initially (the pre-test scores) but that those for the experimental group would be different at the end of the semester (the post-test scores). Furthermore, it was expected that the scores of the control group would remain relatively stable. This design can be expressed symbolically as shown in Table 1.

TABLE 1

NOTATION USED FOR TEST GROUPS

Group	Mean Scores	
	Pre-Test	Post-Test
Experimental	$\bar{x}_{e_1}$	$\bar{x}_{e_2}$
Control	$\bar{x}_{c_1}$	$\bar{x}_{c_2}$

The hypothesized relationships of the four test groups can be stated symbolically as follows:

$$\bar{x}_{e_1} < \bar{x}_{e_2} \ ;$$

$$\bar{x}_{c_1} = \bar{x}_{c_2} = \bar{x}_{c_3} \ ;$$

and $$\bar{x}_{c_2} < \bar{x}_{e_2} \ .$$

[illegible]

Because Ford and Young had used the Semantic Differential (SD) technique this study also used the SD test. Ford and Young provided an example of an SD test in their article but often some revision, discussed below, this test was adopted.

The SD technique is a highly developed, well tested measuring tool frequently employed in attitude and behavioral research. Developed in the 1950's by Osgood, Suci, and Tannenbaum,[16] much work has been done since to support its validity, with only minor changes resulting in the design. Most of the innovation has been in the area of developing word pairings to accompany Osgood's objective factor analysis.[17,18,19]

Reviewers of Osgood, Suci, and Tannenbaum include Stagner,

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[16] C.E. Osgood, G.J. Suci, and P.H. Tannenbaum, The Measurement of Meaning (Urbana Illinois: University of Illinois Press, 1957).

[17] D. Heise, "Semantic Differential Profiles for 1,000 Most Frequent English Words," Psychological Monographs No. 601, 1965.

[18] D. Wiggins and D. Hoffe, "Factor analysis of the Semantic Attributes of 627 Words and Some Relationships to the Connotative Behavior of Older Grade Children," Journal of Experimental Psychology Monograph, Vol. 63 No. 6 Part 2, 1962.

[19] J. Jenkins and D. Russell, "An Atlas of Semantic Profiles for 360 Words," American Journal of Psychology, 1961, 1958 p. 688-699.

psychologists, sociologists, and anthropologists.[20,21,22] Their views of the SD technique and its results vary. Linguists tend to be highly critical about exactly what meaning is being measured by SD: denotative, connotative, or a mixture. Osgood, in fact, entered into a round of rebutals with Weinreich so as to clarify the role of SD in linguistics.[23,24]

Psychologists seem most fascinated with the fact that SD works at all. Miron provides the reader with a good humorous review of The Measurement of Meaning.[25] After discussing the "Osgoodian trinity" of the Evaluative, Potency, and Activity factors used to group or relate adjective pairs, Miron continues:

> It is reasonable if not imperative that we seek a theory which makes the SD structure something more than a reliable freak of nature like that of the consistent direction of rotation in which liquids of this hemisphere depart from sinks.[26]

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[20] J.B. Carroll, A book review of The Measurement of Meaning in Language Vol. 35 No. 1, 1958, p. 58-77.

[21] L.J. Cronback, Essentials of Psychological Testing, 2ed. (New York: Harper & Brothers, 1960) p. 501-504.

[22] U. Weinreich, "Travels Through Semantic Space," Word Vol. 14 1958, p. 346-366.

[23] C. E. Osgood, "Semantic Space Revisited," Word Vol. 15 1959, p. 192-200.

[24] U. Weinreich, "A Rejoinder to Semantic Space Revisited," Word Vol. 15 1959, p. 200-201.

[25] M.S. Miron, "The Semantic Differential and Mediation Theory," Linguistics No. 66 1971, p. 74-87.

[26] Ibid., p. 76.

The decision to use the SD technique was made within the context of repeating the Ford and Young study but with the knowledge that there are shortcomings to the method. Some of the problems encountered in analyzing the test results may be attributed to these short comings. (See Chapter V, RESULTS, below)

Design of the SD

There are two basic elements in the construction of an SD test: concepts and scales. The concepts are the stimuli to which the subjects respond by checking one of the intervals between the scales or adjective pairs. Concepts are typically single nouns or possibly adjectives or noun phrases. Tests have been conducted using pictures projected to a group of subjects rather than using printed word concepts. For particular audiences such as developmentally disabled or mentally retarded people, this technique can be very useful.

Choosing meaningful concepts which are relavant to, and representative of, the area of research is a significant part of the test construction process. Concepts should be chosen to elicit varied individual responses which enhance the amount of information gained. At the same time, the concepts chosen must have a single, unitary meaning, and must be familiar to all subjects. This is particularly a problem in the use of noun phrases or nouns with multiple interpretations, which cause subjects to guess at what

is being judged. This results in a marked regression toward the middle of the scales.

The concepts chosen by Ford and Young are listed below in Table 1. Because the groups being tested in this replication of Ford and Young shared a background in library science, it was felt that several concepts could be changed to bring to the fore the idea of computer technology in a library setting. As a result, concepts 10 and 11 were changed to read COMPUTER-COMPILED BIBLIOGRAPHY and HAND-COMPILED BIBLIOGRAPHY. Concept 13, COMPUTERIZED DATING, lacked currency and was replaced by COMPUTERIZED GROCERY STORES. Concept 15 lacks relevence and was dropped. The broad concept LIBRARY AUTOMATION was added in the hope that it would allow the responses to be divided into groups representing attitudes for, neutral to, or against library automation. The original and revised list of concepts appear below in Table 1.

The second aspect of test construction involves choosing the scales or adjective paris against which the concepts are judged. Osgood, Suci, and Tannenbaum found that although no scale is perfectly reliable in its ability to coincide with only a single factor, most adjective paris can be tested through factor analysis and ranked as relating to either evaluation, potency, or activity factors. Much of the original work and subsequent supporting work was done in evaluating "loadings," that is, which factor group particular adjective pairs related to and how strong that relationship is.

Table 2. Concepts Used in the Ford and Young Survey with Changed Concepts in Parentheses

1.	Technology
2.	Instantaneous Information
3.	Computers
4.	Myself Being a Computer Programmer
5.	IBM
6.	Computers Contribute to the Development of Mankind
7.	Artificial Intelligence
8.	Computers Foul Up My Charge Account Bills
9.	Computer-Monitored Hospital Intensive Care Units
10.	Computer-Crafter Color Television (Computer-Compiled Bibliography)
11.	Hand-Crafted Color Television (Hand-Compiled Bibliography)
12.	Government Information Agency Using Computers
13.	Computerized Dating (Computerized Grocery Stores)
14.	Computer Art
15.	2001: A Space Odyssey (Library Automation)

Osgood's original 50 adjective pairs, or scales, are closely related to one factor, evaluation, potency, or activity. They are "loaded" on one factor but not on the others. A researcher today can consult a dictionary of such scales and choose those with the necessary loading.[27] If adjective pairs of only one factor type are used in a SD test, typically, evaluative scales are chosen. This was the case with the Ford and Young study. Most often, however, an equal mix of evaluation (E), potency (P), and activity (A), loaded scales are used.

Regardless of their loading factor, scales must also be relevant to the concepts being judged. They must have semantic stability. That is, they must be true opposites and capable of being applied the same way to all concepts. Often this is the most subjective aspect of test construction.

Some scales apply well to most concepts. Good-bad, cruel-kind, and new-old exemplify this. Other scales, such as hard-soft or curved-straight, are difficult to use with many concepts. A lack of understanding of a concept, as well as the use of meaningless scales, causes neutral responses. Such responses reduce the amount of information gained from a test.

Table 3 gives the E,P, and A loadings for the scales used in this test. The original eight evaluative pairs from the Ford and Young study were used. In addition, four more E,P, and A scales were added, making a total of twenty scales.

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[27] J. Jenkins and W. Russell, "An Atlas of Semantic Profiles for 360 Words," American Journal of Psychology, LXXI 1958.

Table 3. E, P, and A Loadings for the Scales Used

		Variable No.	Scale	Loadings E	P	A	Dimension (1)
@	*	1	cruel-kind	.52	.28	0	E
	*	2	curved-straight	.08	.12	.14	A
		3	masculine-feminine	-.14	.47	.03	P
@	*	4	untimely-timely	.37	.04	.04	E
		5	active-passive	.17	.12	.98	A
		6	savory-tasteless	.23	-.12	.18	E
@	*	7	unsuccessful-successful	.51	.08	.29	E
		8	hard-soft	-.24	.97	.00	P
@		9	wise-foolish	.57	.06	.11	E
		10	new-old	.20	-.09	.09	E
@		11	good-bad	1.00	.00	.00	E
	*	12	weak-strong	.30	.40	.10	E
@		13	important-unimportant	.38	.04	.31	E
		14	angular-round	-.12	.26	.16	P
		15	calm-excitable	-.15	.03	.26	A
@	*	16	false-true	.50	-.03	.01	E
	*	17	colorless-colorful	.20	-.20	.09	E
		18	usual-unusual	.41	.04	.25	E
@		19	beautiful-ugly	.52	-.29	-.02	E
	*	20	slow-fast	.01	.26	.35	A

@ = also used by Ford and Young
* = reversed pair
(1) = totals are 12 E, 4 P, 4 A scales

Because a great amount of information is obtained even from a relatively small set of scales and concepts, scoring can be a tedious process. An SD packet of 10 concepts rated on 10 scales by 10 people yields 1,000 items of data. For this project 15 concepts were rated on 20 scales by 52 people, resulting in 15,600 elements of data. (Interestingly Kerlinger has suggested that automation be used to overcome this problem of massive SD data.)[28]

Subjects

Three groups of subjects were used in this study. The first was a class in library automation held during the summer of 1975. This group was given the SD test for the purpose of checking for problems in the design of the test. Their responses are not considered in this paper. After examining these tests it was noted that no serious difficulties were apparent in the choice of concepts and scales and the instructions accompanying the test were judged to be clear. This group also provided the researcher an opportunity to practice administering the test.

The remaining two groups were tested during the fall of 1975. Their demographic characteristics are provided in Tables 4 and 5.

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[28] F.N. Kerlinger, Foundations of Behavioral Research, 2nd ed. (New York: Holt, Rinehart and Winston, Inc., 1973) p. 73.

Table 4. Breakdown by Age Groupings of Respondents

Age	Experimental		Control	
	n	%	n	%
20-24	6	46.15	4	30.76
25-29	5	38.46	4	30.76
30-34	2	15.38	2	15.38
35-39			2	15.38
40-44			1	7.69
TOTAL	13	100.00	13	100.00

Table 5. Type of Library Work Preparing For

Type	Number of Responses	%
Public Services		
Control	12	84.61
Experiment	10	76.92
Technical Processing		
Control	0	0
Experiment	1	7.69
Administration		
Control	1	7.69
Experiment	2	15.38

It can be noted in Table 4, above, that participants in the experiment group tended to be younger than those from the control group. The breakdown in Table 5 above, regarding the type of work the students of each group were preparing for is very similar.

Group I, the control group, consisted of a class in children's literature and story telling. This group was chosen because there was no overlapping membership with the experiment group and because it delt with material unrelated to the issue of library automation. It was felt that there would be minimal exposure to automation concepts, hardware, experience, and the like, which were the manipulative factors with the experiment group. The test was administered to this group during the first and last week of the semester. As a control group, change in attitude between the tests was expected to be minimal and within the limits of chance.

Group II, the experiment group, was a class in library automation. Again, individuals were tested during the first and last week of the semester. The treatment of this group was accomplished by its being exposed to and involved with library automation through classwork and assignments. It was expected that this exposure would alter the attitudes of this group in a measureable way.

In the case of both groups there was not a perfect match between those who took the pre-test and those taking the post-test. [illegible]on matching tests within each group, the responses from subjects who took only the pre- or post-tests were discarded, leaving a total of thirteen respondents in each group.

Table 6. Previous Involvement in Automation

Involvement	Number of Responses YES		Number of Responses NO	
	n	%	n	%
Taken Automation Courses or Attended Workshops				
Experiment	7	53.84	6	46.15
Control	3	23.07	10	76.92
Involved in Library Computer Project(s)				
Experiment	1	7.69	12	92.30
Control	1	7.69	12	92.30
Involved Elsewhere in Computer Projects				
Experiment	3	23.07	10	76.92
Control	2	15.38	11	84.61

Table 6 points out one dissimilarity in the background of the two groups. Whereas both groups were equally uninvolved in previous library computer projects, 92.31% responding "no," 53.84% of the experiment group responded that they had taken automation courses or attended computer related workshops. Only 23.07% of the control group had had such experience.

A sample page from the test may be found as Appendix A. The instructions given the subjects were as follows:

> The purpose of this study is to measure the meanings of certain things to various people by having them judge them against a series of descriptive scales. In taking this test, please make your judgements on the basis of what these things mean to you. On each page of this booklet you will find a different concept to be judged and beneath it a set of scales in order. The seven options for each scale can be defined as follows:

very	quite	slightly	neutral	slightly	quite	very
_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____

Each adjective pair response was scored from 1 to 7, or for reversed pairs from 7 to 1, with 1 representing a "negative"feeling and 7 a "positive"feeling. A score of 4 is neutral. For each individual a sum and a mean were determined for the E, P, and A scores for each concept. The sum and mean of the 15 concepts was determined for each individual, again for the three factors of E, P, and A. Finally, group mean scores were determined for the three factors. A summary of this data is presented in the table below.

Table 7. Summary Data for Analysis of Factors

FACTOR	Experimental				Control			
	Pre-Test		Post-Test		Pre-Test		Post-Test	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
EVAL.	774.9	80.1	793.0	47.9	785.7	66.1	799.0	38.9
POTENCY	880.7	89.3	871.4	88.4	891.7	97.0	884.9	84.0
ACTIVITY	878.2	82.8	866.8	80.4	856.9	85.0	887.6	36.7

IV. DATA AND RESULTS

The principal hypothesis of this study was that a change in attitude as measured by use of the Semantic Differential scale would appear among students enrolled in a course on library automation. Similarly it was expected that no change in attitude would appear among students taking a children's literature class (i.e., the control group).

When the data in Table 7 above is analyzed by a t-test, one finds no significant difference between the groups, control or experimental, pre-test or post-test.

Table 8. t-Test Using $\bar{X}_1$, $\bar{X}_2$, and $\hat{s}$ for Means for Experimental and Control Groups

Difference	Evaluation	Potency	Activity
$\bar{X}_{e_2} - \bar{X}_{e_1}$	.09	-.07	-0.36
$\bar{X}_{c_2} - \bar{X}_{c_1}$	.36	-.38	0.06
$\bar{X}_{e_2} - \bar{X}_{c_2}$	-.00	-.57	0.01
$\bar{X}_{e_2} - \bar{X}_{c_1}$	.01	-.09	-0.19

The hypothesized relationships of the four test groups were not substantiated by the data and must be re-stated as follows.

$$\bar{X}_{e_2} = \bar{X}_{e_1}$$

$$\bar{X}_{c_2} = \bar{X}_{c_1} = \bar{X}_{c_2}$$

$$\bar{X}_{e_2} = \bar{X}_{c_2}$$

The question of task-group interaction arose as a possible, or at the least a partial explanation of the ineffectiveness of the results. Using an ANOVA analysis of variance, groups this task-group interaction was examined from seven perspectives. The following three tables provide summary data regarding the test scores for each of the three separate differentiated factors,evaluation, process, and activity, with respect to the total group of 10 concepts. The treatment factor refers to whether the subjects had or had not taken the course in library automation. This factor had two levels, an experimental group and a control group. All three sets of data (one each for evaluation, process, and activity) show an significant difference between the attitudes of the subjects in the two groups. An F ratio of 5.05 would have been required to have had significance at a .05 level. Therefore, neither or not the groups underwent treatment made an difference in their scores.

The concept factor refers to the ratings given to each of the concepts. The F ratios for the S_1 vs. S_2 2 objective pairs of the 45 were 80.15, 10.98, and 31.85, respectively. All these ratios are significant at the .001 level indicating that the concepts were viewed individually, regardless of which of the three factors were being used.

The treatment - concept interaction compares what concept a-ness for each of the concepts between the experiment and control groups. No significant differences are found which indicate that, or not, the experimental and control group subjects did not rate the concepts differentially. That is, it was not the case that some of the concepts were differentially rated while others were not.

The Pre- and Post-test factor reflects the scores given to the concepts on the pre-test as opposed to the post-test. There are no significant differences for these data.

The Treatment - Pre and Post interaction examines the total scores on a given SD dimension for differences pre and post and by experiment versus control group. Again, with regard to their judgment on all 15 concepts, there is no difference between the groups, pre to post.

The Concepts - Pre and Post Interaction compares all the scores for a concept in the pre-test and those scores in the post-test. All show an F value of less than 1.

The last set of figures, the Treatment - Concepts - Pre and Post Interaction is a three-way analysis of how the experiment or control group rated each concept on the pre-test and then on the post-test. This is the most detailed analysis of the data that was made. Neither this nor a post-hoc t-test yielded significant differences.

Table 9. Data Relating to the Evaluation Factor on 15 Concepts

Source of Variation	Degrees of Freedom (df)	Mean Square (MS)	F Value (F)
Treatment	1	51.82	1
Between Group Error	24	542.53	
Concepts	14	1973.55	20.14
Treatment by Concepts Interaction	14	92.82	1
Within Group Error	336	98.01	
Pre & Post	1	70.74	1
Treatment by Pre & Post Interaction	1	.94	1
Within Group Error II	24	178.93	
Concepts by Pre & Post Interaction	14	48.24	1
Treatment by Concepts by Pre & Post Interaction	14	26.48	1
Within Group Error II.	336	51.41	
TOTAL	779		

Table 10. Data Relating to the Potency Factor on 15 Concepts

Source of Variation	Degrees of Freedom (df)	Mean Square (MS)	F Value (F)
Treatment	1	128.78	1
Between Group Error	24	148.21	
Concepts	14	129.39	17.44
Treatment by Concepts Interaction	14	7.79	1.05
Within Group Error I	336	7.42	
Pre & Post	1	54.79	1.18
Treatment by Pre & Post Interaction	1	1.47	1
Within Group Error II	24	46.44	
Concepts by Pre & Post Interaction	14	1.52	1
Treatment by Concept by Pre & Post Interaction	14	2.19	1
Within Group Error III	336	4.01	
TOTAL	779		

Table 11. Data Relating to the Activity Factor on 15 Concepts

Source of Variation	Degrees of Freedom (df)	Mean Square (MS)	F Value (F)
Treatment	1	189.82	2.58
Between Group Error	24	73.52	
Concepts	14	2343.00	21.84
Treatment by Concepts Interaction	14	80.80	1
Within Group Error I	336	2574.31	
Pre & Post	1	26.10	1.03
Treatment by Pre & Post Interaction	1	32.45	1.29
Within Group Error II	24	25.13	
Concepts by Pre & Post Interaction	14	5.48	1
Treatment by Concepts by Pre & Post Interaction	14	2.80	1
Within Group Error III	336	5.52	
TOTAL	779		

The analysis of variance was also run for a subset of the 15 concepts. The subset consisted of four concepts more specific to library automation (see Chapter V, below). Tables 12 through 14 present the data relevant to this subset. The sources of variation are the same as for tables 9 through 11; the data simply reflects fewer concepts.

As with the set of 15 concepts, the subset produced significant differences for the Concepts factor of the three analyses. The F values for E, P, and A are 14.33, 14.02, and 62.01, respectively. These are significant at the .001 level. There are no other differences which can be termed significant in these data.

Table 12. Data Relating to the Evaluation Factor on 4 Concepts

Source of Variation	Degrees of Freedom (df)	Mean Square (MS)	F Value (F)
Treatment	1	30.00	.14
Between Group Error	24	214.91	
Concepts	3	867.29	14.33
Treatment by Concepts Interaction	3	127.66	2.11
Within Group Error I	72	60.50	
Pre & Post	1	27.04	1
Treatment by Pre & Post Interaction	1	10.63	1
Within Group Error II	24	79.63	
Concepts by Pre & Post Interaction	3	6.88	1
Treatment by Concepts by Pre & Post Interaction	3	25.94	1
Within Group Error III	72	42.99	
TOTAL	207		

Table 13. Data Relating to the Potency Factor on 4 Concepts

Source of Variation	Degrees of Freedom (df)	Mean Square (MS)	F Value (F)
Treatment	1	50.58	2.26
Between Group Error	24	22.39	
Concepts	3	138.85	14.02
Treatment by Concept Interaction	3	27.12	2.74
Within Group Error I	72	9.90	
Pre & Post	1	13.56	1.47
Treatment by Pre & Post Interaction	1	.10	1
Within Group Error II	24	9.21	
Concepts by Pre & Post Interaction	3	3.57	1
Treatment by Concepts by Pre & Post Interaction	3	2.07	1
Within Group Error III	72	5.40	
TOTAL	207		

Table 14. Data Relating to the Activity Factor on 4 Concepts

Source of Variation	Degrees of Freedom (df)	Mean Square (MS)	F Value (F)
Treatment	1	18.84	1.01
Between Group Error	24	18.59	
Concepts	3	398.65	62.01
Treatment by Concepts Interaction	3	9.83	1.53
Within Group Error I	72	6.43	
Pre & Post	1	17.62	3.01
Treatment by Pre & Post Interaction	1	2.89	1
Within Group Error II	24	5.84	
Concepts by Pre & Post Interaction	3	.46	1
Treatment by Concepts by Pre & Post Interaction	3	1.42	1
Within Group Error III	72	6.70	1
TOTAL	207		

V. DISCUSSION

Ford and Young concluded that "images of modern technology (including automation)... are presented ambiguously (and) do not allow the receiver to form a definite and rational opinion or attitude."[28] Although this repeat study failed to show a change in attitude over time, it did point out an initial attitude which was above the mean across most concepts tested. There can be no exact contrast made to the Ford and Young study since no data was provided by them in their report, but it appears it is valid to conclude that today's students view technology in a more consistent and positive way.

The lack of significant attitude change on the part of the experiment group as measured by this set of surveys has a number of possible explanations.

First, going back to the original Ford and Young study it is important to note that no statistical analysis was performed on their data. Their conclusions are broad statements couched in terms incapable of being refuted or supported with any accuracy.

> The students evaluated the word "Technology" as more cruel than kind, but more timely than untimely. They also felt it to be more successful than unsuccessful. More wise than foolish, and more good than bad; yet they also found it decidedly more ugly than beautiful.[29]

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[28] J.R. Ford and W.H. Young, "Information Retrieval: Who Needs It?," in National Coloquim on Information Retrieval 7th, Philadelphia 1970 (Philadelphia, college of Physicians of Philadelphia, Medical Documentation Service, 1970) p. 369.

[29] Ibid., p. 372.

One can ask, "What are the scores that reflect a judgment of more cruel than kind?" No numerical data is provided in their study.

Their use of the term "significant" in discussing an inconsistency in attitude measured with the concept COMPUTER is highly suspect, if not meaningless since, again, there is no evidence provided in their paper to substantiate this.[30]

Second, it is felt that the test instrument itself may be at fault. The test presented each respondent with 15 separate concepts to be judged against 20 adjective scales, each having seven degrees of response. Three-hundred answers were required of the participants. Expecting discrimination on this many items presented in one sitting may simply have been asking too much on the part of the respondents. In reviewing other uses of the SD test as reported in Snider and Osgood's "Sourcebook" on SD it was found that the use of 15 concepts, as in this test, was not uncommon.[31] However, most researchers used an average of 12 bi-polar scales, against the 20 used in this study.

It was hoped that a smaller more relevant group of concepts would produce results which may have been buried by the results as a whole. In an attempt to ascertain if such a subset of four library related concepts alone produced a difference pre-test to post-test, the analysis of variance program was run with the data from this group. As noted in Chapter IV, Tables 12 through 14, no significant difference

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[30] Ibid., p. 372

[31] J.G. Snider and C.E. Osgood, "Semantic Differential Technique, a Sourcebook," (Chicago: Aldine Publishing Co., 1969) Chapters 7-9. p. 391-546.

was found. A post-hoc t-test analysis was also done on these four concepts. The mean difference between the pre- and post- scores was not significant (see Table 15 below). Thus showing no support for the idea that these concepts were being treated differentially by the respondents.

Table 15. Post hoc t-test on Evaluation Means for 4 Concepts

Concepts	Mean Pre	Mean Post	Difference (absolute)	t-ratio (SE =1.818)
Instantaneous Information				
Experiment	58.154	59.923	1.769	.973
Control	61.692	58.462	3.230	1.777
Computer-Compiled Bibliography				
Experiment	59.769	58.231	1.538	.846
Control	62.692	62.308	.384	.211
Hand-Compiled Bibliography				
Experiment	54.385	52.538	1.847	1.016
Control	50.308	49.231	1.077	.592
Library Automation				
Experiment	56.923	57.462	.539	.296
Control	59.385	59.385	0	0

Three of the subset of four concepts were the following: COMPUTER-COMPILED BIBLIOGRAPHY, HAND-COMPILED BIBLIOGRAPHY, and LIBRARY AUTOMATION. They appeared as items 10, 11, and 15 near the end of the test. Discrimination on them could have been hampered by physical and mental fatigue felt by the respondents as they reached that point in the test. The fourth concept was the second in the series of 15, INSTANTANEOUS INFORMATION. The results showed no differentiation despite its more advantageous location. It thereby appears that redesign of the test placing the subset of four library related concepts first may not have led to a more discriminating evaluation of them.

Third, as was outlined above in Chapter III, the choice of the concepts and scales used in the test may have caused some difficulty. The majority of the concepts were taken from a previous study (see Table 2, above). The caution that concepts have a single, unitary meaning and be familiar to all subjects could easily have been violated with the concepts COMPUTERS CONTRIBUTE TO THE DEVELOPMENT OF MANKIND, ARTIFICIAL INTELLIGENCE, GOVERNMENT INFORMATION AGENCY USING COMPUTERS, and COMPUTERIZED GROCERY STORES. The result would be neutral tendencies on the scales.

Although the researcher feels confident that the 20 adjective scales used were true opposites there is a question regarding their equal applicability to all of the concepts used. Although evaluative scales are generally the easiest to relate to concepts, when the data was separated out and analyzed for each factor, evaluation, potency, and activity, no significant difference occured in the ability of the respondents to judge concepts on any of the three factors.

The attitudes of library school students as measured by a 15 concept, 20-item bi-polar scale semantic differential test were shown to be only slightly positive. No significant change in attitude, positive or negative, was shown by a re-test after the duration of a semester.

Appendix A. Sample Sheet From Questionnaire

Library Automation

	1	2	3	4	5	6	7	
cruel								kind
curved								straight
masculine								feminine
untimely								timely
active								passive
savory								tasteless
unsuccessful								successful
hard								soft
wise								foolish
new								old
good								bad
weak								strong
important								unimportant
angular								rounded
calm								excitable
false								true
colorless								colorful
usual								unusual
beautiful								ugly
slow								fast

Appendix B. Mean Scores by Concept

Concept		Evaluation[1] Pre-test	Evaluation[1] Post-test	Potency[2] Pre-test	Potency[2] Post-test	Activity[3] Pre-test	Activity[3] Post-test
1. Technology	Experiment	33.385	35.462	21.692	20.308	19.692	19.692
	Control	34.692	34.615	21.077	21.385	20.000	20.692
2. Instantaneous Information	Experiment	38.154	39.923	18.538	17.385	20.462	19.538
	Control	61.692	58.462	20.077	19.692	20.846	21.231
3. Computers	Experiment	35.308	37.308	20.769	19.769	21.231	19.615
	Control	34.462	36.154	22.000	21.000	22.308	20.846
4. Myself Being a Computer Programmer	Experiment	49.923	45.000	17.077	16.538	17.154	15.769
	Control	42.231	42.769	17.615	17.154	16.231	17.692
5. IBM	Experiment	34.231	34.615	21.462	20.923	19.615	18.615
	Control	34.385	33.923	22.231	20.769	20.615	19.077
6. Computers Contribute to the Development of Mankind	Experiment	35.077	36.692	19.538	18.615	19.462	17.385
	Control	37.000	37.538	20.000	20.231	18.769	19.308
7. Artificial Intelligence	Experiment	47.462	49.154	18.846	18.538	17.231	17.231
	Control	43.462	50.462	19.000	18.692	18.769	19.308
8. Computers Foul Up My Charge Account Bills	Experiment	46.308	43.385	18.077	17.769	15.308	15.000
	Control	43.462	44.154	18.615	17.692	16.692	17.538
9. Computer-Monitored Hospital Intensive Care Units	Experiment	53.308	58.077	17.769	17.462	19.846	18.615
	Control	60.769	60.538	18.769	18.769	20.615	20.154
10. Computer-Compiled Bibliography	Experiment	59.769	59.231	16.923	16.692	19.615	19.077
	Control	62.692	62.308	19.308	18.000	20.923	20.231
11. Hand-Compiled Bibliography	Experiment	54.385	52.538	16.308	15.615	15.231	14.462
	Control	50.308	49.231	15.231	14.385	14.462	13.846
12. Government Information Agency Using Computers	Experiment	47.846	53.615	19.538	18.462	19.000	18.846
	Control	53.615	55.615	20.385	20.000	19.385	20.462
13. Computerized Grocery Stores	Experiment	45.615	47.615	17.308	17.385	17.538	17.769
	Control	51.077	51.769	18.846	18.385	19.231	20.154
14. Computer Art	Experiment	39.615	40.923	19.000	17.769	17.308	16.692
	Control	40.462	42.077	19.154	19.231	18.077	17.462
15. Library Automation	Experiment	36.923	37.462	17.846	18.385	19.538	18.462
	Control	39.385	39.385	19.385	19.462	20.000	19.615

[1] The pooled standard error for this data is 1.989 [2] The pooled standard error for this data is .956

[3] The pooled standard error for this data is .852

Appendix E. Mean Scores by Concept, Pre-Subject

Concept		Evaluation[1] Pre-test	Evaluation[1] Post-test	Potency[2] Pre-test	Potency[2] Post-test	Activity[3] Pre-test	Activity[3] Post-test
8. Instantaneous Information	Experimental	58.154	59.923	48.538	47.385	49.462	48.538
	Control	61.000	58.462	50.077	48.846	49.846	49.231
10. Computer-Compiled Bibliography	Experimental	59.769	58.231	48.923	48.846	48.615	48.077
	Control	60.000	60.308	48.308	48.000	50.923	50.231
11. Hand-Compiled Bibliography	Experimental	54.385	58.538	46.308	48.615	48.231	49.462
	Control	58.308	60.231	49.231	49.385	49.462	48.846
19. Library Automation	Experimental	56.923	57.462	47.846	48.385	48.538	48.462
	Control	59.385	59.385	48.923	48.462	50.000	48.615

[1]The pooled standard error for this data is 1.818
[2]The pooled standard error for this data is .606
[3]The pooled standard error for this data is .718

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